

# ◆ DELTA GREEN GROUND BEETLE

## INTRODUCTION

The Delta green ground beetle, a federally listed threatened species, is associated with vernal pool habitats. The distribution and populations of this species has declined substantially, primarily as a result of the loss or degradation of habitats within its range. The loss of habitat and declining condition of these species populations have warranted their listing as threatened or endangered under the federal Endangered Species Act.

Major factors that limit this resource's contribution to the health of the Delta are related to adverse effects of conversion of native habitats for agricultural, industrial, and urban uses, and land and water management practices that degrade habitats used by these species.

## RESOURCE DESCRIPTION

The Delta green ground beetle is found at the Jepson Prairie Preserve in Solano County, which is in the Yolo Basin Ecological Management Zone. The Delta green ground beetle and its soft-bodied prey species are most often observed on moist environments such as those provided by Olcott Lake and vernal pools within the Jepson Prairie Preserve. Vernal pools and aquatic seasonal habitats supply the critical needs of the Delta green ground beetle. Entomologists believe that appropriate conditions for the species are found in open, moist habitats with limited vegetative cover.

Since 1974, entomologists have seen or collected only 75 adult Delta green ground beetles in the preserve area. Although the historical distribution of the Delta green ground beetle is unknown, the widespread disruption of wetland and grassland habitats in the Central Valley over the last 150 years strongly suggests that the range of the beetle has been reduced and fragmented. Today, the beetle predominately inhabits the borders of vernal pools and Olcott Lake at the Jepson Prairie Preserve. The primary threats to the survival of the Delta green ground beetle have been, and continue to be, loss and alteration of its wetland habitat primarily because of agricultural conversion (i.e., the plowing and leveling of land); grazing; river channelization; and construction of dams, drainage ways, and pipelines.



## VISION

The vision for the Delta green ground beetle is to contribute to the recovery of this federally listed threatened species by increasing their populations and abundance through habitat restoration.

Protecting existing and restoring additional suitable seasonal wetlands, including vernal pools, and associated grasslands will be critical to recovery of the Delta green ground beetle in the Bay-Delta. Restoration of these habitats in the Sacramento-San Joaquin Delta Ecological Management Zone will help maintain healthy populations by increasing the quality and quantity of habitats used by this species.

The Delta green ground beetle would also benefit from cooperative management strategies with The Nature Conservancy's Jepson Prairie Preserve.

## INTEGRATION WITH OTHER RESTORATION PROGRAMS

There are a number of programs that involve these species:

- U.S. Fish and Wildlife Service,
- California Department of Fish and Game (DFG),
- California State Parks and Recreation,
- Riparian Habitat Joint Venture,
- DFG's Calhoun Cut Reserve, and
- TNC's Jepson Prairie Preserve.

## LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Restoration of these species is integrally linked with restoration of seasonal wetland, riparian, inland dune, perennial aquatic, and grassland habitats in the Central Valley and are adversely influenced by the detrimental effects of invasive plant species.

## OBJECTIVE, TARGETS, ACTIONS, AND MEASURES



The Strategic Objective is to contribute to the recovery of at-risk native species in the Bay-Delta estuary and its watershed.

**SPECIES TARGET:** Protect all known occupied habitat areas from potential adverse affects associated with current and potential future land uses, and establish three additional populations of the delta green ground beetle within its current and/or historic range.

**LONG-TERM OBJECTIVE:** Expand the existing population of Delta green ground beetle and establish at least three additional populations to remove it from the federal threatened species list.

**SHORT-TERM OBJECTIVE:** Expand the existing population levels of Delta green ground beetle by increasing and improving its habitat.

**RATIONALE:** The Delta green ground beetle is federally listed as a threatened species that is currently known only from Jepson Prairie Preserve (Solano County). Habitat requirements for this species are not clearly understood but the beetles seem to require open places near vernal pools. A better knowledge would help restoration efforts. Limiting pesticide use in adjacent areas and increasing habitat are two ways to increase population size but until we know what the ideal habitat is, a mixture of habitats that could be used by this species is essential.

**STAGE 1 EXPECTATIONS:** The existing population of Delta green ground beetle will have been studied in order to develop a clearer idea of what its habitat requirements are. Additional areas of vernal pool habitat in Solano County will have been acquired and managed for the beetle and other native species.

### RESTORATION ACTIONS

The following general target will assist in meeting the implementation objective:

- Increase the numbers and distribution of Delta green ground beetle.

The following general programmatic actions will assist in meeting the targets:

- Protect and restore wetland, riparian, and grassland habitat.
- Implement control measures to eradicate invasive plant species.
- Design and manage restored seasonal wetlands and grasslands near Delta green ground beetle populations to improve habitat quality for the species.
- Introduce species into unoccupied or restored habitat areas.
- Reduce land and water management practices that degrade habitats used by these species.

### MSCS CONSERVATION MEASURES

The following conservation measures were included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would help achieve Delta green ground beetle habitat or population targets.

- Coordinate protection, enhancement, and restoration of delta green ground beetle populations and its habitat with other federal and state programs (e.g., U.S. Fish and Wildlife Service species recovery plans and management of the Jepson Prairie Preserve) that could affect management of current and historic habitat areas to avoid potential conflicts among management objectives and identify opportunities for achieving multiple management objectives.
- Direct ERP actions towards protecting, enhancing, and restoring suitable vernal pool and associated grassland habitat within the species historic range, including expansion of Jepson Prairie Preserve westward to Travis Air Force Base.
- To the extent consistent with ERP objectives, direct ERP actions towards protection of the Davis Antenna Site population.

- Conduct surveys to identify suitable habitat areas, including enhanced and restored habitats, for establishment of additional populations in the Delta and Bay Regions and implement species introductions to establish three additional populations.
- To the extent consistent with CALFED objectives, manage lands purchased or acquired under conservation easements that are occupied by the species to maintain or increase current population levels and enhance occupied habitat areas.

## REFERENCES

Multi-Species Conservation Strategy. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.

Strategic Plan for Ecosystem Restoration. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.

## ◆ SPECIES DESIGNATED AS MAINTAIN

### INTRODUCTION

The Strategic Plan for Ecosystem Restoration presents 6 goals to guide the implementation of restoration actions during the 20-30 year program.

The first Strategic Goal focuses on at-risk species:

This section addresses those species designated as "Maintain" in the MSCS and ERP.

*STRATEGIC GOAL 1: Achieve, first, recovery and then large self-sustaining populations of at-risk native species dependent on the Delta and Suisun Bay; support similar recovery of at-risk native species in the Bay-Delta estuary and its watershed; and minimize the need for future endangered species listings by reversing downward population trends of native species that are not listed.*

### MAINTAIN DESIGNATION

**MAINTAIN ("M"):** For species designated "m," the CALFED Program will undertake actions to maintain the species. This category is less rigorous than "contribute to recovery." For this category, CALFED will avoid, minimize, and compensate for any adverse effects to the species commensurate with the level of effect on the species. Actions may not actually contribute to the recovery of the species; however, at a minimum, they will be expected to not contribute to the need to list an unlisted species or degrade the status of an already listed species. CALFED will also, to the extent practicable, improve habitat conditions for these species.

The "maintain" species addressed in this section include:

- western least bittern
- hardhead
- California red-legged frog
- California tiger salamander
- western pond turtle
- western spadefoot toad

- California freshwater shrimp
- mad-dog skullcap \*
- rose-mallow \*
- eel-grass pondweed
- Colusa grass
- Boggs Lake hedge-hyssop
- Contra Costa goldfields
- Greene's legenera
- heartscale
- recurved larkspur.

\* Denotes species which were described previously in the vision for tidal brackish and freshwater marsh special-status plant species and inland dune special status plants.

Note: the use of Species Targets in this section is synonymous with the Species Goal Prescriptions provided in the Multi-species Conservation Strategy.

# ◆ WESTERN LEAST BITTERN



## INTRODUCTION

This species is considered part of the heron family and is its smallest member. The Western least bittern utilizes freshwater tidal and nontidal marshes and wetlands for foraging and nesting habitat. The population and distribution of this species have declined substantially primarily as a result of reclamation of its wetland habitats and because of its decline is a Department of Fish and Game California "Special Concern Species," is on Audubon's Blue List, and is a U.S. Fish and Wildlife Service "Migratory Nongame Bird of Management Concern." The major factor that limits this resource's contribution to the health of the Delta is related to the adverse effects of historical and current loss or degradation of freshwater wetlands.

## RESOURCE DESCRIPTION

The Western least bittern inhabits stands of emergent vegetation within freshwater marshes and wetlands. Shallow water, emergent cover, and substrate with high invertebrate abundance are the most important features of Western least bittern habitat. The bittern is also known to feed on amphibians, fish, crayfish, and small mammals.

Much of the Western least bittern's wetland habitats have been destroyed or modified since the mid-180's.

This decline in wetlands has reduced population densities of the bitterns throughout their range.

Habitat loss is largely a result of reclamation for agricultural, industrial, and urban uses and water management projects. The total area of those remaining habitats represents only a small percentage of their history level. These habitats continue to be threatened by sedimentation, water diversions, recreational activities, water quality, and land use practices. Insufficient quantity and quality of wetland habitat is the primary factor limiting recovery of the species' population in the estuary. Other factors that can also adversely affect the Western least bittern include disturbance during its breeding period, contaminants, and excessive predation by non-native species.



## VISION

The vision for the Western least bittern is to contribute to the recovery of this species to contribute to overall species richness and diversity.

Achieving this vision will reduce conflict between the need for its protection and other beneficial uses of land and water in the Bay-Delta.

Restoring suitable tidal and nontidal freshwater wetlands in the Bay-Delta is critical to the recovery of the species in the estuary. These restored habitats would provide nesting and foraging habitat for the Western least bittern. Although the Western least bittern's range extends into other ecological management zones, the primary focus for habitat restoration will be in the Sacramento-San Joaquin Delta Ecological Management Zone. Efforts outside the Delta to restore freshwater habitats would also benefit the species.

## INTEGRATION WITH OTHER RESTORATION PROGRAMS

Many programs designed to benefit broader groups of fish and wildlife that use or depend on wetlands, sloughs, or adjacent aquatic systems in the Bay-Delta

also benefit the Western least bittern. some of these are operated by the following organizations:

- San Francisco Bay Area Wetlands Ecosystem Goals Project,
- California Coastal Conservancy,
- Delta Native Fisheries Recovery Team,
- San Francisco Bay National Wildlife Refuge,
- U.S. Fish and Wildlife Service San Francisco Bay Program, and
- Tidal Wetlands Recovery Plan Ecosystem Wetland Goals Project.

## LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Restoration and recovery of the Western least bittern population of the Bay-Delta is integrally linked with wetland restoration, and water quality (contaminants) improvement.

## OBJECTIVE, TARGETS, ACTIONS, AND MEASURES



The Strategic Objective is to maintain abundance and distribution.

**SPECIES TARGET:** An increase in or no discernable adverse effect on the size or distribution of species populations.

**LONG-TERM OBJECTIVE:** Restore the western least bittern to the status as a common overwintering marsh bird in the Central Valley and Delta.

**SHORT-TERM OBJECTIVE:** Develop wintering habitat for least bitterns by creating "no disturbance" refuges along the central corridor of the Central Valley and Delta for all shore and wading birds.

**RATIONALE:** The western least bittern, a California Department of Fish and Game Species of Special Concern nests in emergent wetlands of cattails and tules in the upper and lower reaches of the Central Valley but winters in marshlands along the main rivers and in the Delta. Least bitterns were apparently once a common wintering bird in the

Central Valley but are now scarce. The loss of wintering habitat as a result of channelization and reclamation of marsh lands along the major rivers and Delta has been a major factor in their decline. Therefore, to increase their overwintering survival, there needs to be an increase in contiguous areas of emergent marsh along both the Sacramento and San Joaquin rivers. Important, but less critical, is the need protect breeding habitats not only in the Central Valley but along the Colorado River and Salton Sea.

**STAGE 1 EXPECTATIONS:** A thorough review of the status and habitat requirements of western least bittern will have been conducted. Areas within the Central Valley will have been set aside as "no disturbance" refuges to protect wintering habitat of bitterns and other wading and shore birds from human disturbance.

## RESTORATION ACTIONS

The general target is to increase the number of breeding pairs of Western least bittern in the Bay-Delta.

General programmatic actions to achieve the target for the Western least bittern include:

- restore the natural tidal action of aquatic habitats;
- preserve the remaining populations of Western least bittern, tidal and nontidal freshwater marsh habitats;
- implementation of management programs for small water diversions, disturbance, land use changes, and contaminants would improve habitat, reproductive potential, and recruitment for Western least bitterns;
- protect tidal and nontidal freshwater marshes and wetlands from adverse land uses;
- protect nearby unoccupied suitable habitats areas would help ensure natural expansion area is available;
- protect existing suitable habitats by implementing conservation easement purchasing from willing landowners, or establishing incentive programs to maintain suitable habitat;

- develop and implement alternatives to land management practices on public lands that continue to degrade the quality or inhibit the recovery of Western least bittern habitats; and
- restore, protect, and improve tidal and nontidal wetlands.

## MSCS CONSERVATION MEASURES

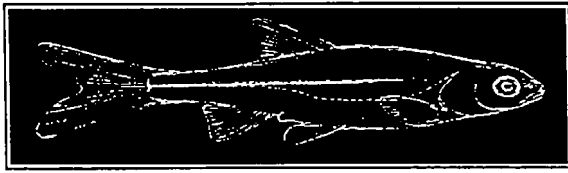
The following conservation measures were included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would help achieve western least bittern habitat or population targets.

- To the extent consistent with ERP objectives, design and manage wetland habitat restorations and enhancements to provide suitable nesting and foraging habitat conditions.
- To the extent consistent with ERP objectives, restore wetland habitats adjacent to occupied nesting habitats to create a buffer zone of natural habitat to protect nesting pairs from potential adverse effects that could be associated with future changes in land use on nearby lands and to provide foraging and nesting habitat areas suitable for the natural expansion of populations.

## REFERENCES

- Bent, A.C. 1963. Life histories of North American marsh birds. Dover Publications, Inc., New York. 392 pp.
- Multi-Species Conservation Strategy. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.
- Strategic Plan for Ecosystem Restoration. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.
- Tacha, T.C., and C.E. Braun, editors. 1994. Migratory Shore and Upland Game bird Management in North America. International Associations of Fish and Wildlife Agencies, Washington, D.C. 223 pp.
- Zeiner, D.C. and W.F. Laudenslayer, Jr., eds. 1990. California's Wildlife, Volume II, Birds, California Statewide Wildlife Habitat Relationships

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## INTRODUCTION

Hardhead are one of many species of minnow, native to the Sacramento-San Joaquin watershed. Hardhead are also found in the Napa River watershed. —

Hardhead are listed as a species of special concern by the California Department of Fish and Game. The Multi-Species Conservation Strategy includes hardhead as an evaluated species with a species goal of “maintain” (MSCS 1999a).

Possible factors contributing to the decline of hardhead include predation and competition by non-native species, loss and degradation of habitat, poor foodweb productivity, losses to water diversions, and reduced survival from exposure to toxins in the water.

## RESOURCE DESCRIPTION

Native minnows such as hardhead, hitch, and California roach are important species occupying important and diverse ecological niches in Central Valley low to mid-elevation streams.

The habitat attributes of the low to mid-elevation streams are characterized by deep, bedrock pools, clear water, and cool temperatures. Within higher quality habitats, hardhead are typically found in association with other native fishes including Sacramento pikeminnow and Sacramento sucker (Moyle 1996). Moyle et al. (1996) pointed out that hardhead are one of the most specialized species in the Sacramento-San Joaquin watershed and their long-term survival is dependent on clear, cool water and deep pools. These habitats are the locations that have been most impacted or lost by the construction of large mid-elevation reservoirs.

Hardhead populations are also susceptible to declines resulting from predation by non-native species. This has been observed in the South Yuba River and the

Kings River as a result of the introduction of smallmouth bass. Introduced species were identified as the most significant cause of population declines, and included, to lesser degrees, the construction and operation of dam and diversions, changes in aquatic habitat, watershed disturbance, and a variety of other factors (Moyle et al. 1996).

Hardhead typically mature and reproduce during their second year. Their spawning occurs in the spring following extensive upstream migration. Young hardhead feed mainly on planktonic organisms then prey on increasingly larger organisms. Mature hardhead are bottom browsers and feed on aquatic plants such as filamentous algae and small invertebrates. In some areas, larvae of mayflies and caddisflies provide the primary prey items. Adult hardhead occupy the lower portion of the water column and juveniles utilize the shallow water areas close to the stream margins (MSCS 1999b).

Hardhead are found within the following Ecological Management Zones:

- Sacramento River
- North Sacramento Valley
- Cottonwood Creek
- Colusa Basin
- Feather River/Sutter Basin
- American River Basin
- Yolo Basin
- Eastside Delta Tributaries
- East San Joaquin
- West San Joaquin, and
- Suisun Marsh/North San Francisco Bay (Napa River Ecological Management Zone).

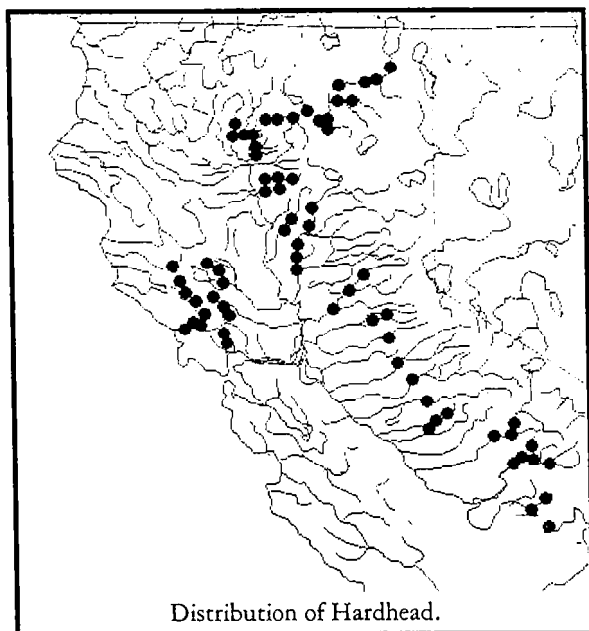


## VISION

The vision to maintain and restore the distribution and abundance of hardhead to contribute to the overall species richness and diversity.

Achieving this vision will reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.





Ecosystem processes are closely tied to habitat restoration needs and actions. Resident species would benefit from conditions to maintain productivity and suitability of spawning and rearing habitat (including production of food). Actions to rehabilitate ecosystem processes include: providing adequate flow and temperatures. Flows need to be provided to support channel maintenance such as scour and sediment transport.

Stressor reduction is a major component of restoration and maintenance of resident species populations. A primary concern with regard to vulnerable species is the reduction of losses to diversions. Actions to reduce losses installing fish screens on currently unscreened facilities, removing predators associated with diversions and fish protection facilities, relocating and consolidating existing diversions, changing seasonal timing of diversions, and reducing the number of diversions. Resident species would also benefit from actions to reduce pollutant input to streams and rivers in the Sacramento-San Joaquin River basin and may benefit from actions to prevent introduction of non-native species that would prey upon or compete with native species for habitat and food supply.

## INTEGRATION WITH OTHER RESTORATION PROGRAMS

Efforts to restore and maintain resident species would involve cooperation and support from other

established programs that protect and improve conditions for delta smelt, striped bass, and other species.

- The Recovery Plan for the Sacramento/San Joaquin Delta native fishes will be considered in the development of actions.
- Central Valley Project Improvement Act will implement actions that will benefit resident species, including changing the timing of diversions and restoring habitat.
- The State Water Resources Control Board will implement the Water Quality Control Plan for the San Francisco/Sacramento-San Joaquin Delta estuary that will include provisions to limit entrainment in diversions and protect habitat conditions for Sacramento splittail, chinook salmon, striped bass, and other species.

## LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Restoration efforts relating to resident fish will be linked to efforts to maintain and restore health stream corridors, fish passage flows or structures, and water quality.

## OBJECTIVE, TARGETS, ACTIONS, AND MEASURES



The Strategic Objective is to maintain abundance and distribution.

**SPECIES TARGET:** An increase in or no discernable adverse effect on the size or distribution of species populations.

**LONG-TERM OBJECTIVE:** Within 25 years, all hardhead will have stable or increasing populations, in multiple localities, with localities interconnected as much as feasible.

**SHORT-TERM OBJECTIVE:** Determine the distribution, status, and habitat requirements of hardhead in the Bay-Delta watershed to see if species-specific strategies are needed to reverse declines or if habitat-oriented restoration strategies will be adequate.

**RATIONALE:** The Central Valley has a native resident fish fauna that is largely endemic to the region. Some species are extinct (thicktail chub) or nearly extinct (Sacramento perch) in the wild. While some native species (e.g., Sacramento pikeminnow [squawfish], Sacramento sucker) are clearly thriving under altered conditions, others are not (e.g., hitch, Sacramento blackfish, hardhead). Although most of these species may benefit from actions listed under goal 2, there is a need to determine if some have unique problems or requirements that will prevent them from responding to general habitat improvements.

**STAGE 1 EXPECTATIONS:** A distribution and status survey of native stream fishes will have been completed. Sites with high species richness or containing rare species will have been identified for special management. A recovery strategy for native fish assemblages will have been developed.

## RESTORATION ACTIONS

The target for hardhead is to increase their abundance and distribution.

Hardhead would benefit from the following general restoration activities:

- adding and modifying physical habitat,
- restoring riparian areas,
- protecting existing shallow-water habitat from erosion,
- installing screens on unscreened diversions,
- removing predators at diversions,
- relocating or consolidating diversions,
- reducing concentrations of toxins in Bay-Delta waters, and
- preventing further introductions of non-native aquatic organisms.

## MSCS CONSERVATION MEASURE

The following general conservation measure was included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions

that would help achieve species habitat or population targets.

- To the extent consistent with Program objectives, manage lands purchased or acquired under conservation easements to maintain or increase current population levels of resident evaluated species.

## REFERENCES

- Moyle, P.B. 1996. Status of Aquatic Habitat Types. In: Sierra Nevada Ecosystem Project: Final Report to Congress, vol. II, Assessments and scientific basis for management options. Davis. University of California, Centers for Water and Wildland Resources.
- Moyle, P.B., R.M. Yoshiyama, and R.A. Knapp. 1996. Status of Fish and Fisheries. In: Sierra Nevada Ecosystem Project: Final Report to Congress, vol. II, Assessments and scientific basis for management options. Davis. University of California, Centers for Water and Wildland Resources.
- Multi-Species Conservation Strategy. 2000a. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.
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